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I S O
ORGANISATION INTERNATIONALE DE NORMALISATION
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO/TC 97/WG B
CHARACTER SETS AND CODING
Secretariat :
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COMPUTERS AND INFORMATION PROCESSING

WG B CHARACTER SETS AND CODING

U.K. Specification

Data Processing Codes for Punched Tape

310/3
NMA17

PG/nsm
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U.K. Specification

Data Processing Codes for Punched Tape

Historical Note

The application of punched paper tape in connection with computer installations arose from its use with the teleprinter equipment which was available on the prototype machines of 1948-1949. It subsequently developed as a popular medium for the storage and transmission of data, including conversion to and from punched cards and magnetic tape.

The introduction of mechanical and later, electronic, aids to accountancy, office systems, machine tool control, process control and other parts of business and scientific life, led to the introduction of more specialized equipment.

Tape coated with a material designed to carry data in the form of magnetized spots (first for domestic sound reproduction, later for data recording) led to a desire to combine punched cards, punched tape and magnetic tape to provide an integrated data processing system.

The problems arising from these developments eventually caused users, designers and programmers to consider the possible advantages of standard specifications. But by the time standardization was investigated the situation had become complicated by the multiplicity of codes already in use on the one hand and the unprecedented speed of development of equipment on the other.

Many codes had been prepared on an empirical basis and the approach to them had been affected by two factors. Firstly, the limitations of the machine circuitry, and secondly the desirability of improving the speed and accuracy of the operations of processing the data.

Early in the era under consideration the development of digital computers encouraged consideration of the binary number system as a basis for all codes and a complex set of circumstances confronted those charged with investigating the possibility of preparing some standard forms of coding for general use.

Foreword

The preparation of this Specification took several years during a period of most intense technical development in the data processing industry.

An obvious outcome of this expansion in the use of computer installations was a diversity in the codes established by the various manufacturers of the equipment. As usual in these cases many of the differences in coding were in detail only as the main functions were generally similar. With the growth of interest was a realization that rationalization of the coding situation was necessary if anarchy was not to hold sway and, as a consequence, investigations

.../...

started with a view to the preparation of basic codes which would allow interchangeability between equipment from varying sources.

The publication of B.S. 3 174 at the end of 1959 (which deals with Alpha Numeric Codes for punched cards) led to the adoption of a coding scheme based on convenient card-to-tape conversion when the first punched tape coding proposals were put together. The comments on those proposals from industry in general led to the abandonment of the historical approach in favour of one more directly related to the current and future needs of users. The two most important needs (apart from that of avoiding a large number of different codes all applying to 6 bit characters for instance) were to aim for optimum programming and processing facilities inside a computer and to facilitate the exchange of tapes between computers from different sources. Apart from the advantages of being able to send tapes physycally from a unit in one part of a country to another, or even between countries, codes such as those in this standard specification will be of enormous value in facilitating the introduction of common programming languages both nationally and internationally, although at the present juncture efforts have been concentrated on coding for actual data rather than programming. Thus the adoption of these codes will simplify and therefore materially assist the design and development of associated peripheral equipment such as readers, sorters, data loggers, printers, keyboard punches etc...

One important aim of the codes in the form presented in this document is to allow as much flexibility and freedom of choice of character coding as is compatible with a general specification applying to a wide field. Accordingly the actual coded positions are defined for only the most important or fundamental characters and functions, while blank positions are left in each code for discretionary use as required.

As has been indicated the codes given in this specification are concerned primarily with the input, output and processing of data in direct association with an electronic computer installation. The separate transmission of data over line or radio channels is considered as a matter not directly affecting the form of the coding with the exception of the International Telegraph Alphabet No.2 using five tracks (popularly known as the Telex code). The suitability of the codes in this standard for the transmission of data directly over the telecommunications network still depends on what network facilities are available and the degree of accuracy which is required. In order to achieve some accuracies it may be necessary to re-code data into a more redundant form.

Nothing in this Specification refers to punching codes for the control of machine tools. The field of such codes is somewhat different from those which are used in data processing and computer installations and, in view of this, and also because of its importance, the subject has been dealt with separately, but simultaneously. A separate specification referring solely to a code for machine tool control will be issued soon after the publication of this present British Standard.

This British Standard has been prepared under the auspices of the Data Processing Industry Standards Committee.

SPECIFICATION

SCOPE

1. This B.S. specifies punching codes for use on paper tape in computers and associated data processing equipment.

.../...

The codes are for 4, 5, 6, 7 and 8 tracks. In addition the International Telegraph Alphabet No. 2 is included for information.

PRESENTATION OF THE CODES

2. The items listed below apply to all the codes in this specification, and to the way they are illustrated.

(a) The codes are indicated on sections of punched tape by means of circular black marks or the absence of such marks.

(b) The code for each character or function shall be read transversely across the full width of the tape at 90° to the longitudinal axis.

(c) A hole is indicated by a black circular mark and the absence of a hole by the absence of a mark.

(d) A punched hole is considered as binary 1 and the absence of a hole as binary 0.

(e) All codes shown shall be considered as viewed from above with the guide edge of the tape on the right hand side and with the tape movement toward the user or toward the bottom of the page.

Alternatively the tape could be considered as having been turned through 90° with the guide edge toward the foot of the page and the direction of movement from right to left as in normal tape installations.

(f) Irrespective of the number of tracks required by any code (the tracks apply longitudinally) every code shall be read as having three tracks between the guide edge and the feed (sprocket) holes.

ZONES AND VALUES

3. The maximum number of characters allowed without substitution by the codes in this Specification is 128.

The coding for each character is given in the form in which it will be punched on the tape. Against each is shown the decimal value of each punching if each hole is given the binary value or weighting shown at the head of each column.

The binary values are in the range 0 to 63½ and are arranged in zones, each zone having 16 binary positions.

The more-significant bits determine the zone in which the characters appear and the four less-significant bits (those with values 1 to 8) determine the position of the characters within the zones.

Note : The four track code having 4 bits per character uses only one zone.

The 6 and 7 track codes have values from 0 to 63 and each of them uses four zones.

.../...

The 8 track code is presented in two parts. The first having values from 0 to 63 and the second from ½ to 63½. Both use four zones.

SPECIAL CHARACTERS

4. The special characters referred to in this clause are those for which coding is given other than aphabetical, numerical and functional.

The special characters given below are included among those in the various codes and when the specific requirements of a situation demand that a change shall be made and other special characters substituted in a code, it is those below which shall be changed first.

(By this means the standard codes will be subjected to a minimum dislocation).

Left bracket	(	Right bracket	)
Sterling sign	£	Ampersand	&
Asterisk	*	Solidus	/

10 and 11 when used as pence signs.

USE AND FUNCTION OF THE ESCAPE CHARACTER

5. The 6, 7 and 8 track codes include a character known as ESCAPE. In order that the optimum value is obtained from it the character shall have a unique configuration and value 62 is allocated for this reason.

When printed ESCAPE shall be shown with the symbol ⇕ which is referred to as a lozenge.

This character shall be used to indicate that the next (following) single character has a special meaning, i.e. different from that shown in this specification.

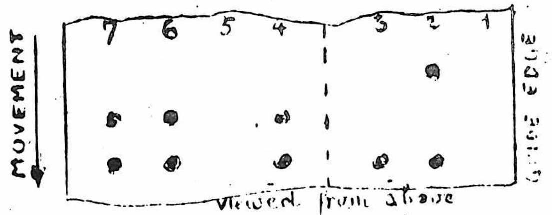
ESCAPE shall be considered as a non-locking shift character meaning Shift-Out for the next single character only in contradistinction to the actual Shift-Out character which means 'Lock-Out' until the Shift-In instruction is encountered. ESCAPE may be used for example as a warning, or as a control that the next character is to be treated as a function. The following character may mean 'Lock the Shift' and thus ESCAPE may be used to escape from the standard code to any other code or to obtain compatibility between codes or for future extensions.

ESCAPE shall be used only for this type of operation thus leaving each data processing system free to allocate whatever special meanings may be required for the following character.

ESCAPE shall form part of a convention to deal with the instruction IGNORE FAULT, this convention being.

.../...

ESCAPE followed by X followed in turn by NewLine, which would be shown in the 7 track code for example as



This sequence is used when some serious fault is noticed while data is being recorded in blocks. In such instances the whole block is punched again and the faulty block will be ignored on input to the computer.

INTERPRETATION OF CERTAIN FUNCTIONAL CHARACTERS

6. The functions dealt with in this clause are coded in this Specification and shall be interpreted in the manner indicated.

Shift-Out and Shift-In

The Shift-Out code means that all the characters which follow shall be interpreted as out of the current set of characters until a Shift-In character is reached. Shift-In will bring the system back into the original set of characters.

For example the equipment may be working in Upper Case. A Shift-Out signal takes the working into Lower Case until a Shift-In character is encountered when the equipment returns to Upper Case.

Runout

Is associated with the Shift-In character in the codes and is intended for use with Leaders and Trailers. It will allow for titles to be written on that part of the tape which is not punched.

Erase

Normally to be used for overpunching erroneous characters and will be ignored on input to the computer.

Space

This character will cause a non-printing operation on a printer.

Note : This corresponds to the use of the space-bar (thumb-bar) on a typewriter.

NewLine

This is a combined Carriage Return (CR) and Line Feed (LF) function.

.../...

For those machines which require separate codes for these functions, code value 1 shall be used for Carriage Return and code value 2 shall be used for Line Feed.

ARQ

This code is used in some systems of data transmission. The data sent is checked at the Receive terminal and, in the event of any query, the code ARQ is transmitted to the Send terminal to request re-transmission.

Decimal Point

When printed the decimal point shall be always on the printing line and will also be used as a full stop.

PARITY

7. A parity check is included in both the 7 and the 8 track codes.

In order to ensure compatibility between the 5, 6, 7 and 8 track codes, the parity check where incorporated shall always be in the 5th track.

BASIC CODE

8. There are 5 computer codes in this specification of which the first two, for 4 and 5 track tapes, are intended for relatively simple applications while the others are derived from the 6 bit basic code which has been specifically developed for more advanced use and may be used within a Data Processing system.

This basic code has been shown directly on a 6 track tape but, because of the lack of checking properties it is unlikely to have extended use in practice. Its importance lies in the fact that it is actually used within some computer systems and it forms the basis on which others are built. It also ensures compatibility between the 6, 7 and 8 track codes and, of even greater importance because of its function as the basic code, it allows for future extensions of character sets which will not upset the standard forms of coding or the installations in which they are used.

In accordance with the 6 data bit coding principle, the 7 track code is identical with the 6 track plus odd parity; the 8 track code is identical with the 6 track plus overall even parity and with the eighth track having the binary value ½ used to achieve Lower Case working.

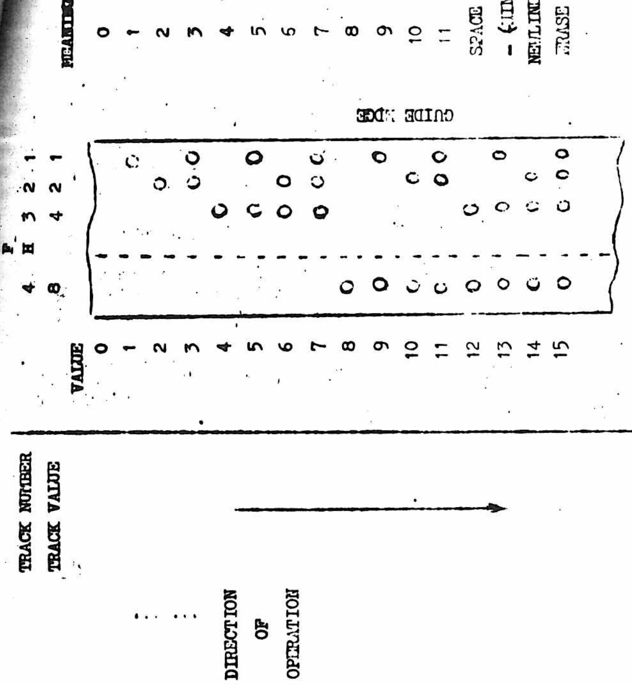
The 5 track code is not closely related to the 6 track. Because it is limited to 5 tracks and is generally considered as having no parity there are certain inherent disadvantages in the use of this code. But there is a means by which partial checking can be effected and users are referred to the notes on page 7 immediately preceeding the diagrams of the 5 track code.

The 4 track code is derived from the 5 track and is a simple numeric form covering the numerals 0 to 9 together with 10 and 11 for sterling purposes. It has a limited application but is sometimes found of use in conjunction with certain simple office machine routines.

THE CODES

9. The punched tape codes to which this specification applies shall be those given in the following pages for 4, 5, 6, 7 and 8 tracks.

Special notes and explanations are appended to the individual codes where applicable.



THE TAPE IS VIEWED FROM ABOVE

NEWLINE IS A COMBINED CARRIAGE RETURN AND LINE FEED FUNCTION

THIS IS 5 TRACK TAPE WITH ONLY 4 IN USE

FOUR TRACK CODE (NUMERIC ONLY)

FIVE TRACK SHIFT CODE

As generally considered this code uses all five tracks for data and therefore it has no parity check. It can, however, be dealt with in a slightly different manner which will allow some element of checking, at least for numerical data.

When considered as a straight five track code, five of the characters A or 1, B or 2, D or 4, H or 8 and P or zero are represented by a single hole; therefore the loss of a hole in any one of these positions could have serious consequences. In fact, in the event of punching being missed, five of the numerals (1, 2, 4, 8 and 0) could disappear.

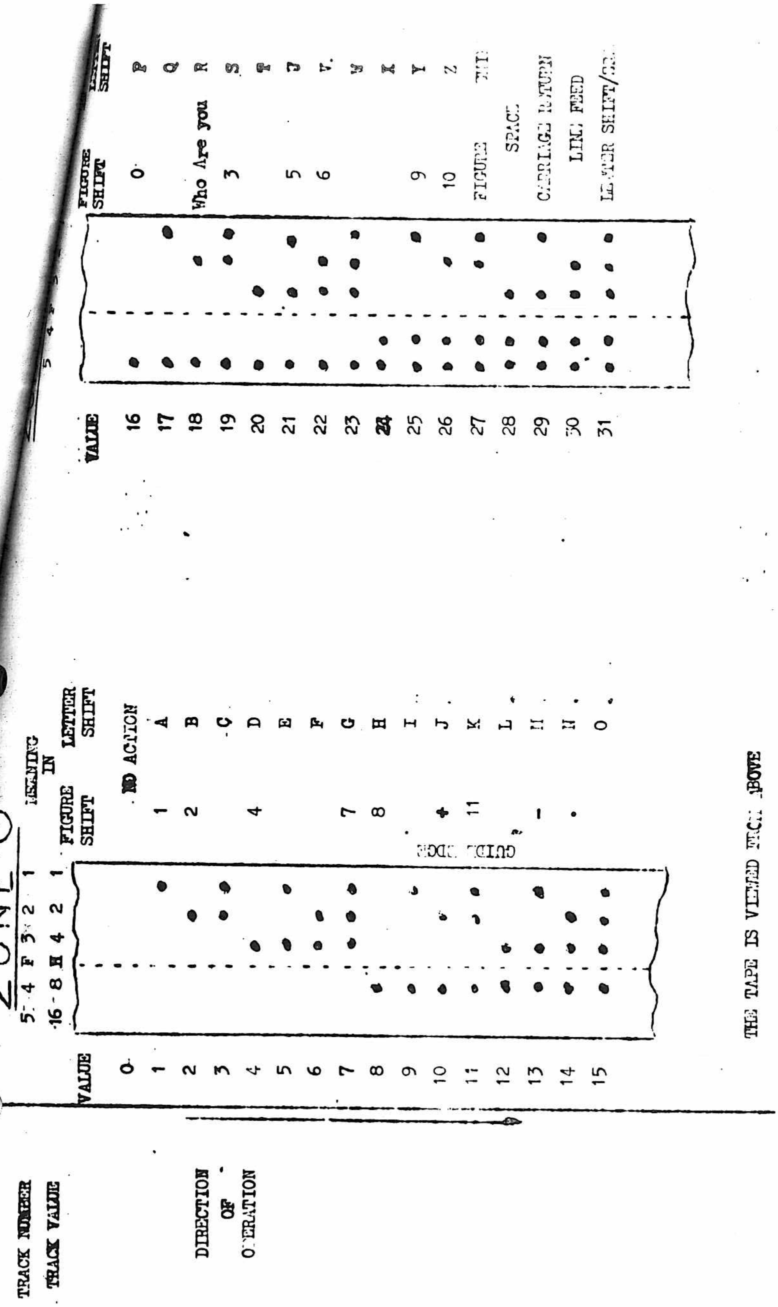
The factor covering the choice of this code is therefore the standard of accuracy which is required.

One way in which the accuracy of numerical data can be ensured is shown in the second diagrammatic presentation. This gives the code in two sub-sets, of which the first applies only to numerical data and is shown coded with odd parity, although still using only five tracks. The second sub-set is coded with even parity, but is not likely to have as much application as the first. It is only included to complete the full set of characters in the five track code. Many computer programmes and conventions for preparing tapes have been established to take advantage of the partial checking feature of this type of 5 track code.

Because of the restrictive size of this code it has been necessary for the Letter Shift and Erase functions to be allotted the same punching and so ERASE will bring the printer into Letter Shift.

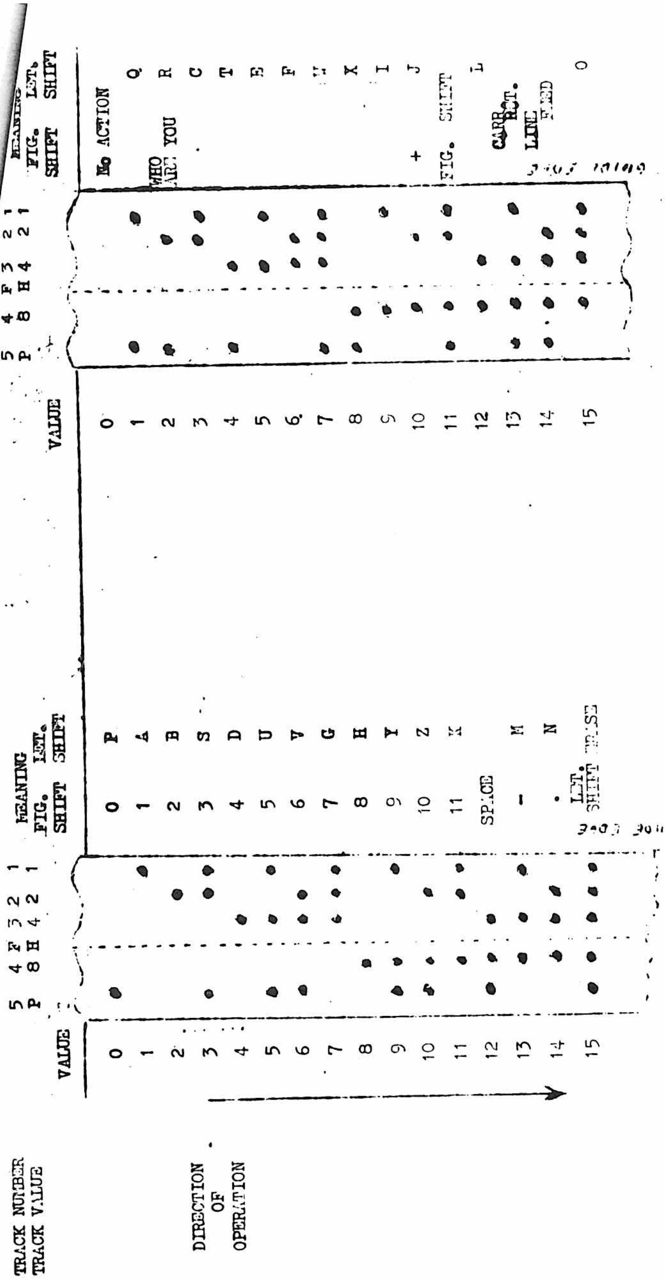
A comparison of this code with the International Telegraph Alphabet No. 2 will show that "Figure Shift", "Letter Shift", "Who Are You" and "No Action" have been given identical coding. This is intended to assist transmission of the five track shift code over telecommunications networks.

.../...



THE TAPE IS VIEWED FROM ABOVE

FIVE TRACK SHIFT CODE (IN NORMAL BINARY SEQUENCE)



ODD PARITY SUB-SET

EVEN PARITY SUB-SET

THE TAPE IS VIEWED FROM ABOVE

FIVE TRACK SHIFT CODE (ARRANGED AS A CHECKING CODE)

INTERNATIONAL TELEGRAPH ALPHABET No. 2

This is sometimes referred to as the CCITT Code or more popularly as the Telex Code. It uses 5 tracks.

The diagram shows on the left the official layout as presented by the CCITT.

The right hand side of the diagram shows the code in the form it would take if presented in binary sequence.

The view showing the binary sequence is given here solely as an interesting comparison. It has no value in the understanding of the code because the scheme was developed for the purpose of transmission of data over the telecommunication networks not for use in computer installations.

.../...

IN CCITT LAYOUT

DIRECTION OF OPERATION

TRACK Nos COMBINATION Nos	1	2	FH	3	4	5	LETTERS	FIGURES	COM. Nos	1	2	FH	3	4	5	LETTERS	FIGURES
1	●	●					A	-	17	●	●		●		●	Q	1
2	●				●	●	B	?	18		●			●		R	4
3		●		●	●		C	:	19	●			●			S	APOSTROPHE '
4	●				●		D	Who are you	20						●	T	5
5	●						E	3	21	●	●		●			U	7
6	●			●	●		F		22		●		●	●	●	V	=
7		●			●	●	G		23	●	●				●	W	2
8				●		●	H		24	●			●	●	●	X	SOLIDUS /
9		●		●			I	8	25	●			●		●	Y	6
10	●	●			●		J	BELL	26	●					●	Z	+
11	●	●		●	●		K	(	27					●		CARRIAGE RETURN	
12		●				●	L	)	28		●					LINE FEED	
13				●	●	●	M	DECIMAL .	29	●	●		●	●	●	LETTER SHIFT	
14				●	●		N	COMMA ,	30	●	●			●	●	FIGURE SHIFT	
15					●	●	O	Q	31				●			SPACE	
16		●		●		●	P	0	32							No ACTION	

BIN. VALUE	1	2	FH	3	4	5	LETS	FIGS	BIN. VALUE	1	2	FH	3	4	5	LETS	FIGS
0							No ACTION		16	●						E	
1						●	T	5.	17	●					●	Z	+
2					●		CARR. RET.		18	●				●		D	
3					●	●	O	Q	19	●				●	●	B	?
4				●			SPACE		20	●			●			S	
5				●		●	H		21	●			●		●	Y	
6				●	●		N	,	22	●			●	●		F	
7				●	●	●	M	.	23	●			●	●	●	X	
8	●						LINE FEED		24	●	●					A	-
9	●					●	L	)	25	●	●				●	W	
10	●				●		R	4	26	●	●			●		J	
11	●				●	●	G		27	●	●			●	●	FIG	
12	●			●			I	8	28	●	●		●			U	
13	●			●		●	P	0	29	●	●		●		●	Q	
14	●			●	●		C	:	30	●	●		●	●		K	
15	●			●	●	●	V	=	31	●	●		●	●	●	LET	

THE TAPE IS VIEWED FROM ABOVE

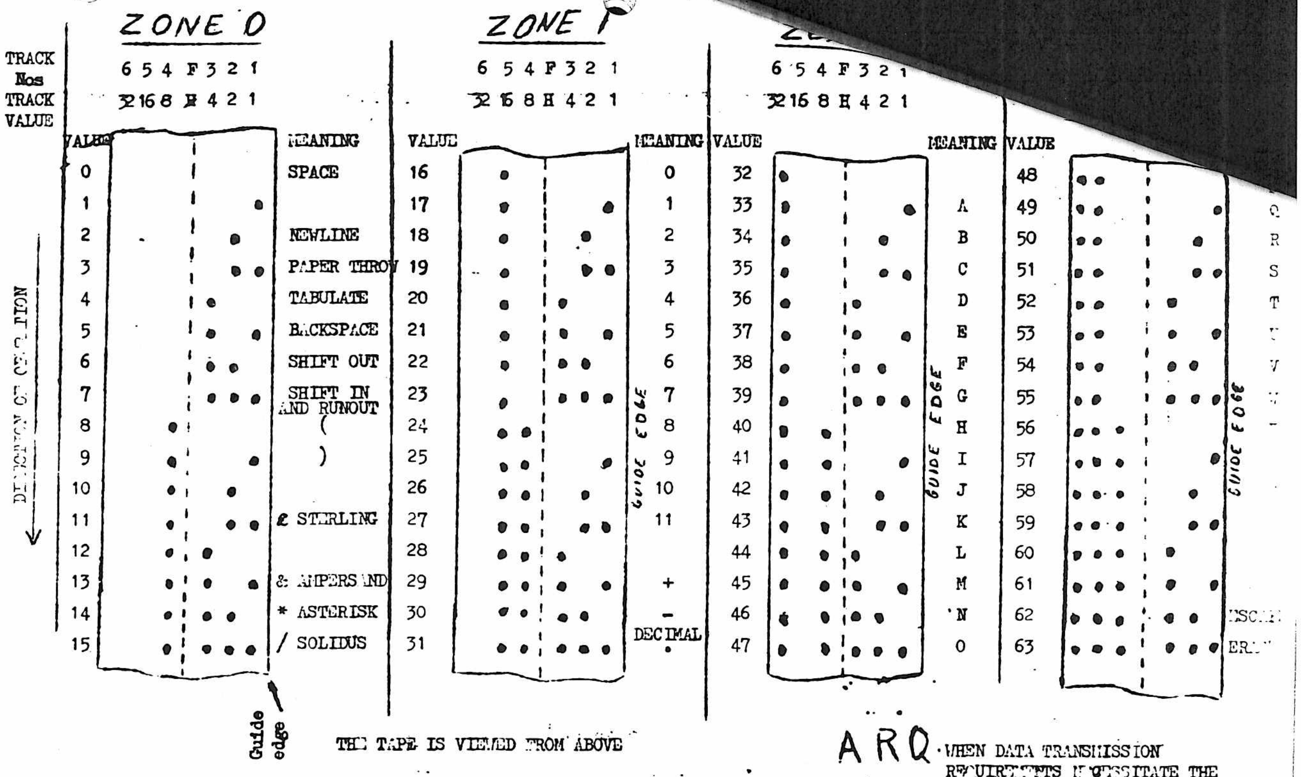
INTERNATIONAL TELEGRAPH ALPHABET No 2

SIX TRACK CODE

This is the BASIC CODE having 6 data bits with no parity check.

The main function of this code in this specification is as the foundation on which the other codes are based.

…/…



VALUE	MEANING	VALUE	MEANING	VALUE	MEANING	VALUE	MEANING
0	SPACE	16	0	32		48	
1		17	1	33	A	49	Q
2	NEWLINE	18	2	34	B	50	R
3	PAPER THROW	19	3	35	C	51	S
4	TABULATE	20	4	36	D	52	T
5	BACKSPACE	21	5	37	E	53	U
6	SHIFT OUT	22	6	38	F	54	V
7	SHIFT IN AND RUNOUT	23	7	39	G	55	W
8	(	24	8	40	H	56	
9	)	25	9	41	I	57	
10		26	10	42	J	58	
11	£ STERLING	27	11	43	K	59	
12		28		44	L	60	
13	& AMPERSAND	29	+	45	M	61	
14	* ASTERISK	30	–	46	N	62	ESC
15	/ SOLIDUS	31	DECIMAL .	47	O	63	ER

THE TAPE IS VIEWED FROM ABOVE

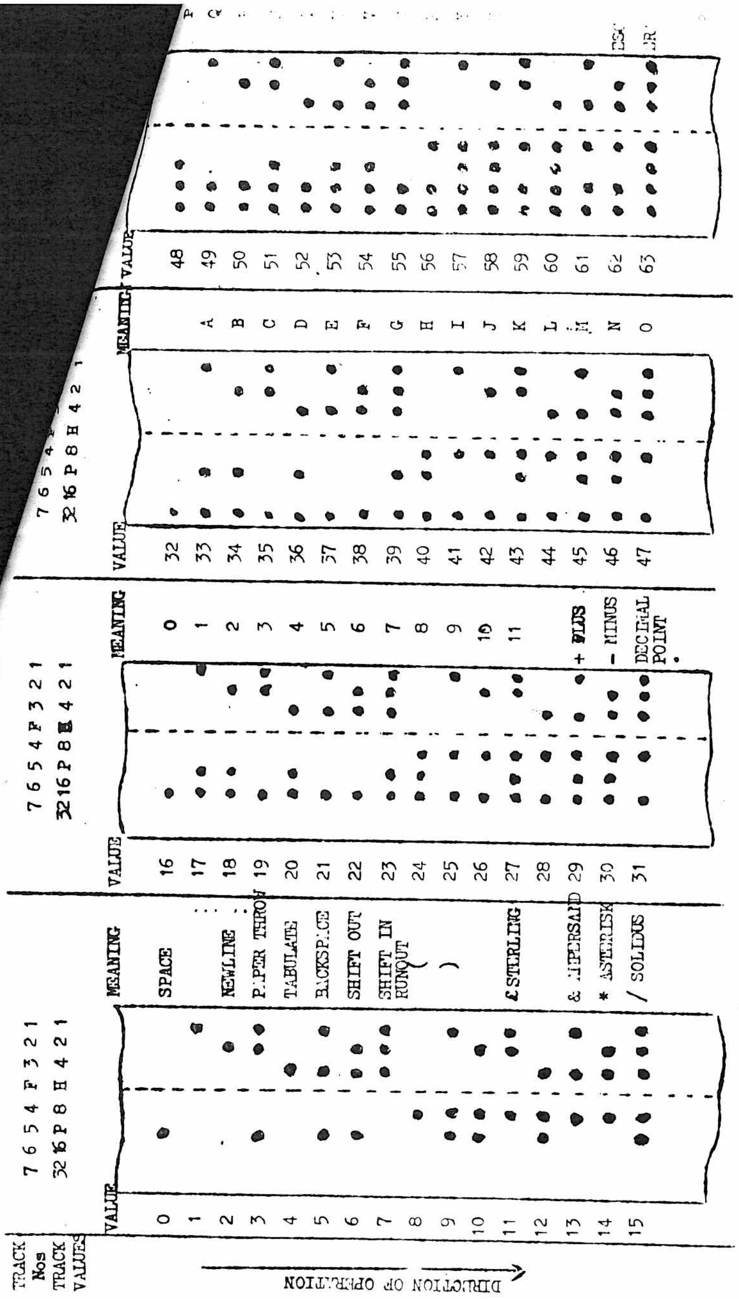
ARQ · WHEN DATA TRANSMISSION REQUIREMENTS NECESSITATE THE INTRODUCTION OF THIS CODE (SEE CLAUSE 6) VALUE 61 SHALL BE USED

SIX TRACK CODE. WITHOUT PARITY

SEVEN TRACK CODE

This has 6 data bits plus odd parity intended for use in computer installations and integrated data processing systems.

It is not intended for use in machine tool control to which a separate specification applies.



THE TAPE IS VIEWED FROM ABOVE

ARQ. WHEN DATA TRANSMISSION NECESSITATES THE INTRODUCTION OF THIS CODE (SEE CLAUSE 6) VALUE 61 SHALL BE USED

SEVEN TRACK CODE. ODD PARITY

EIGHT TRACK CODE

This code is an extended version of the 6 track. It has the same 6 data bits with the addition of Even parity and an eighth track used in this specification to obtain a shift into Lower Case.

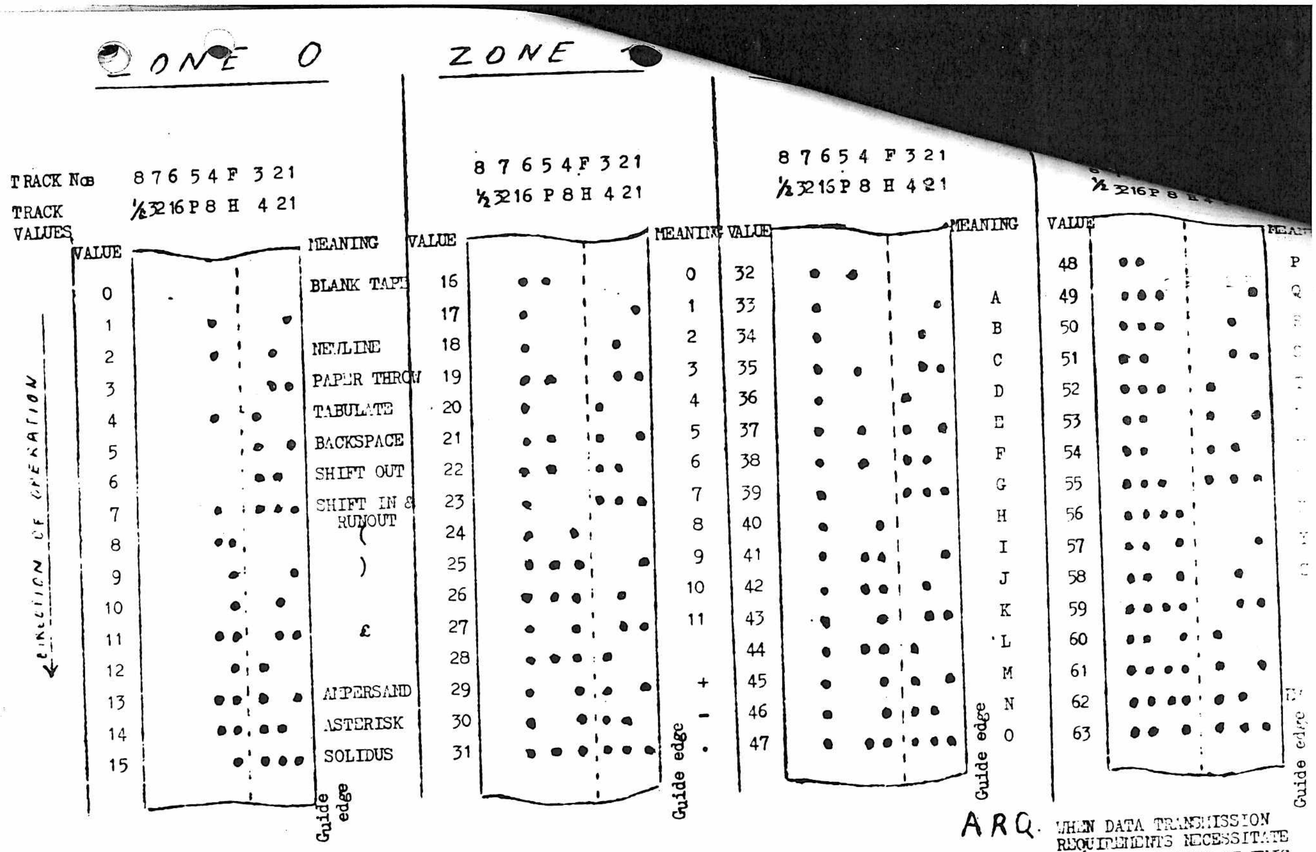
Because the shift function is the sole requirement from track 8 it does not have the normal binary value of 64. Accordingly it is given the binary value $\frac{1}{2}$ which makes it the least significant bit and this causes the values of all the characters to be increased by $\frac{1}{2}$ as shown in the Lower Case section of the code.

In the Lower Case shift the code allows for the lower case alphabet, the numerals 0 to 9 and those functions which are imperative; thus there are many spare positions which can be allocated as desired.

The numerals 0 to 9 which are coded in zone 1 of the Lower Case section of the code are intended to be used as subscripts.

The ordinary numerals are those shown in zone 1 of the Upper Case section.

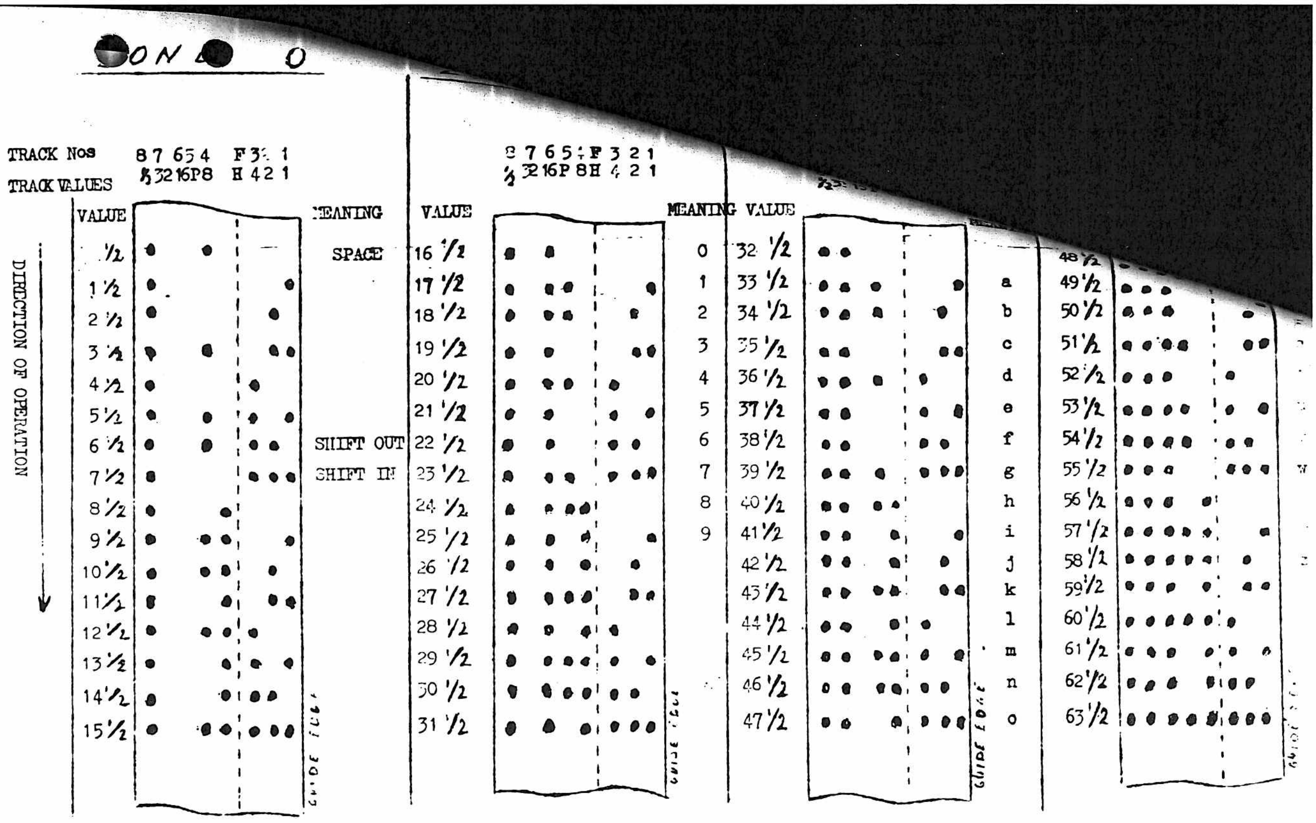
.../...



ARQ. WHEN DATA TRANSMISSION REQUIREMENTS NECESSITATE THE INTRODUCTION OF THIS CODE (SEE CLAUSE 6) VALUE 61 SHALL BE USED

THE TAPE IS VIEWED FROM ABOVE

EIGHT TRACK CODE - UPPER CASE - EVEN PARITY



THE TAPE IS VIEWED FROM ABOVE

NOTE. THE NUMERALS 0 TO 9 CODED IN ZONE 1 SHALL BE USED ONLY AS SUBSCRIPTS

EIGHT TRACK CODE. LOWER CASE. EVEN PARITY

T. Bourguet

February 6, 1962

X3 Sectional Committee
BEMA Headquarters
235 East 42nd Street
New York 17, N. Y.

Gentlemen:

Attached you will find the following documents:

a) Proposed American Standard Code for Information Interchange
X3.2/1 Nov. 10, 1961

b) Appendices A, B & C
X3.2/2 Dec. 27, 1961

c) Expository Remarks on the Proposed American Standard Code for Information Interchange
X3.2/3 Feb. 2, 1962

The first two documents (X3.2/1 and X3.2/2) are submitted for your approval in accordance with the by-laws and procedures as set forth by the American Standards Association. The third document (X3.2/3, Feb. 2, 1962) is additional information and background information in accordance with your request.

In accordance with ASA requirements, written ballots were taken on the Proposed Standard Code for Information Interchange (X3.2/1 - Nov. 10, 1961) and on the Appendices (X3.2/2 - Dec. 27, 1961). The results of this balloting are tabulated in the attachment. The "Expository Remarks" (X3.2/3 - Feb. 2, 1962) were developed and approved at the X3.2 meeting of January 31st, and February 1st and 2nd, 1962.

These documents represent end result of over 7000 man hours work by highly qualified specialists. This effort has been expended over nearly a year and a half. Sixteen meetings of the Subcommittee have been held.

The members of the Committee are varied in background as indicated in the attached report. All have substantial experience in their field. Hence the membership of X3.2 is well balanced and knowledgeable.

The X3.2 Subcommittee, as one of its initial steps, undertook a review of coded character sets currently in use. This review confirmed that there are scores of codes in use today with several variations associated with each code. Out of this review one conclusion was obvious. A standard coded character set is desperately needed if information interchange on a practical basis is to become an operating reality.

CBI 67/1/4

The nature of the problem was determined to be as follows: The rapidly increasing population of data processing systems and equipment in the United States is based on the requirements by business and industry for such systems and equipment in order for individual companies to keep pace with their daily buiness. This expanding population is creating an increasing demand for the direct interchange of information among information processing systems, communication systems and associated equipment. This interchange of information is accomplished either by recording the information on a physical medium (such as punched paper tape, punched cards, mag tape, etc.).and transferring the recorded medium from one system or apparatus to another; or by linking the systems or equipment by a communication network; or a combination of two. Hence, general information interchange involves a wide variety of equipment at varying levels of sophistication produced by a number of manufacturers. To facilitate information interchange on a general and practical basis it is necessary that an array of standards be established. Certainly, the coded character set is primarily among these.

As noted above, a review of existing codes was undertaken early in the work of X3.2. The primary purpose of this review was to determine if there existed a coded character set which came suitably close to meeting the criteria so that it could be proposed as the standard. This analysis was repeated at several points in the course of the work. In each case the results were negative. Each of the existing codes was designed to solve the need in a particular area and was unsatisfactory when studied from a general information interchange point of view.

The design of the coded character set has taken into account the requirements of sophisticated data processing equipment and the simpler typewriter-like devices. Consideration was given to both data and message producing, handling, and receiving equipments. Information content was considered to range from numeric data, to English text. The problem was and is a complex one. A summary of the design considerations and criteria is included in the Appendices to the Proposed Standard.

The design of a coded character set was difficult when considerations were restricted to domestic requirements. In studying the requirements of a code for international use, a number of additional factors were taken into account such as the larger alphabets used abroad and the need for dealing with the Sterling monetary system. Another complicating factor in considering an international standard, is the fact that those involved in code work in Europe may quite possibly place different weights on the criteria than was established in this country. To resolve these points and to pursue the code standardization work on an international basis the following plan has been established:

1. Delegation from X3.2 attending ECMA TC-1 meeting in March, 1962.

2. Participation in meeting of Working Group B of ISO TC/97 to be scheduled for May, 1962.

3. Participation in meeting of ISO TC/97 to be held in October, 1962.

It is self-evident that a single coded character set must be established as a standard if general information interchange is to become an operating reality. This standard code will constitute one of the cornerstones upon which the array of standards required to provide truly practical information interchange will be built.

The design of the proposed code is based on the broad criteria resultant from the analysis of the general information interchange problem. It is evident coded character sets of different size may be desirable, if not economically required, in certain restricted applications which do not involve general information interchange. Care has been taken to provide codes which are simply related to the standard to meet these requirements. For example: a six-bit version corresponding to the 64 character graphic set might be quite satisfactory for use in data processors. Similarly, the four-bit numeric set might well be used in application involving certain classes of bookkeeping machines and other similar apparatus. While use of these simply related sets could well provide the satisfactory solution to many of these application, a wide array of sets are derivable through slightly more complex transformations.

While codes of different sizes may be used in these restricted applications, it is obvious that for general information interchange a satisfactory single code must be used so that difficulty will not arise with other equipment which depends upon the existence of the standard code in an interchange situation.

Implementation of any standard is dependent both upon time and need. The need for a standard is increasing rapidly as outlined above. In terms of time it is believed that the standard will first be implemented in general information interchange links. For existing systems and equipment, it is believed the code first will be implemented at the interface between these systems and equipment and the general information interchange link. It is hoped that the design of the code is such as to permit, in time, implementation of the code directly, or of simply related sets, into the internal design of the hardware.

A note of urgency is sounded in the identification of the exploding need for information interchange on a general basis. It should be noted that communication industry is rapidly moving toward the identification of a new standard code and implementation of this code in their equipment. Further, a number of data processing equipment manufacturers are also adopting new codes for their next generation equipments. To add to the timeliness and urgency of the situation, those involved in corresponding industries in Europe have identified the same need and are pursuing rigorously their efforts toward standardization in this area. In total, the situation points toward an urgent need to develop a satisfactory solution to this problem on a timely basis. It is believed that the draft standard presents such a timely and satisfactory solution.

In summary, the draft standard has been developed by a conscientious group of highly skilled professionals working over the last year and a half. Further, the experience and knowledge which had been woven into the design of the code covers efforts in this area by the members over the past decade. This work is passed on to you for your consideration and approval as the next step in processing, as delineated in the by-laws and procedures of the American Standards Association. It is hoped that you will give this proposal your earnest consideration and timely attention.

Sincerely,

C E Macon

C. E. Macon
Chairman X3.2

CEM/aks

Attch:

RESULTS OF WRITTEN BALLOT ON PROPOSED AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (X3.2/1 NOV. 10, 1961) AND APPENDICES A, B & C (X3.2/2 DEC. 27, 1961)

Member (1)	Alternate (1)	Affiliation	Written Vote X3.2/1 (Draft Standard)	 X3.2/2 (Appendices)
J. F. Auwaerter	--	Teletype	Approved	Approved
L. Bloom	L. S. Mitter	N.C.R.	Approved	Approved
T. H. Bonn	*R. E. Utman	Rem. Rand Univac	Approved	Approved
L. L. Griffin	W. E. Velander	D.O.D.	Approved	Approved
R. Gryb	*J. Booth	A. T. & T.	Approved	Approved
H. Kleinberg	*H. Spielman	R.C.A.	Approved	Approved
W. J. Leubbert	--	U.S. Army	Abstain (2)	Abstain (2)
R. W. Reach	T. McNamara	Minneapolis-Honeywell	Approved	Approved
H. J. Smith	--	I.B.M.	Approved	Approved
H. Tholstrup		Friden	Approved	Approved
A. L. Whitman		Bell Labs	Approved	Approved

NOTE: C. E. Macon, as Chairman, could not vote.

(1) As existed at time of ballot. Signed ballot for Appendices A, B & C, on X3.2/2, dated December 27, 1961.

(2) Major Leubbert, through press of official duties, has been unable to participate over the past several months. On this basis, he felt unable to submit a well-considered vote on the subject documents.

* Signed ballot on X3.2/1, Proposed American Standard Code for Information Interchange, November 10, 1961, for Member.

2-6-62
CEM:mp
(REU:ror)

ECMA TC-1 and ASA X 3.2

Joint Meeting

Rome, Italy, March 8 & 9, 1962

Abstract

Informal meetings with European data processing and communication companies, attended by Messrs. L. Bloom of the National Cash Register Company and J. F. Auwaerter of the Teletype Corporation in January of 1962 and by Messrs. C. Macon of the Burroughs Corporation and J. Booth of the Teletype Corporation in March of 1962, preceded the joint ECMA TC-1/ASA X 3.2 meeting.

The status at the conclusion of the joint meeting is as follows:

1 - ECMA TC-1 is developing a coded character set, which is to be:

a - Easy to process inside of a data processor.

b - Readily applicable to input/output devices (periphery machines for data processors).

c - Used as a common language on media used for the interchange of data between data processors.

2 - ECMA TC-1 has not fully established the number and order of controls and symbols; two working groups were appointed

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during the joint meeting to study the problem.

3 - The code developed by ECMA will be a 6-bit code; the ECMA Committee is in general agreement that a 7-bit, or possibly an 8-bit code will be necessary when they consider the general information interchange problem.

4 - The two committees agree that it appears possible to structure a 7-bit set for information interchange which will collapse satisfactorily into a 6-bit set for the European data processors. The expansion, although more complex, also appears satisfactory.

5 - Some rearrangement of the controls and symbols of the Proposed American Standard Code for Information Interchange will be necessary to accomplish the above (Item 4).

6 - The ECMA TC-1 working groups have been directed to report to the next ECMA TC-1 meeting,now scheduled for April 24-26; advanced copies of the report will be transmitted to ASA X3.2.

7 - An ASA X3.2 ad hoc committee will be formed to study the various machine controls, taking advantage of the work of ECMA TC-1, in terms of the domestic requirements, and to review the report of the ECMA TC-1 working groups.

8 - X3.2 will meet on April 11-13 to review the information then available, and, in cooperation with ECMA TC-1, prepare a recommendation for ISO/TC97 Working Group B which meets in May, 1962.

9 - There has been no formal liaison between ECMA TC-1 and the interested groups of CCITT. However, CCITT is aware of the activity of ECMA TC-1; a few of the members of ECMA TC-1 are also members of committees (or study or working groups) of CCITT.

REPORT

Technical Committee 1 of the European Computers Manufacturers Association (ECMA) met jointly with the ASA Sectional Subcommittee X3.2 in Rome, Italy, on March 8-9, 1962, to discuss the present Proposed American Standard Code for Information Interchange and the coded character set now under development by ECMA, and to establish the possibility of arriving at a 7-bit international code for information interchange so structured as to permit a simple logical collapse to a European computer 6-bit set.

Mr. H. McG. Ross presented the position of ECMA TC-1, viz.:

1 - To develop a coded character set which would:

- a - Be easy to process inside of a computer.
- b - Be readily applicable to periphery machines (input/output).
- c - Enable the use of common language on media used for the interchange of data between different installations.

2 - The set should be a 6-bit set, with a numeric 4-bit subset, for general purpose 6-bit computer applications. The code is to be used internally in the computer.

3 - The code should be capable of being expanded by means of:

a - Escape function.

b - Two shifts or additions of extra bit(s).

c - Logical expansions.

4. The basic structure of the code should be that which is illustrated in Fig. 1 (B). The two symbols following the digit 9 may be replaced with the digits 10 and 11 for use in Sterling monetary areas. Three positions after the letter Z were to be reserved for expansion to the Scandinavian alphabet.

Mr. Ross stated that although ECMA TC-1 and ASA X3.2 have different scopes and therefore a different approach, there is no difference in substance. He commented that the Proposed American Standard Code for Information Interchange (ASCII) would not conveniently collapse into a useful 6-bit set for ECMA but encouraged the discussion of ways and means to overcome this difficulty.

ECMA is deeply concerned with the arrangement of the controls, since it so vitally affects the design of input/output devices. Mr. Eadie stated that there was general agreement in ECMA as to the placement of controls, viz., in the top of the first stick of the 6-bit set, but that the specific order and meaning was still under consideration.

A basic premise of ECMA TC-1 is that the elements of a system are known and therefore the controls may have dual (or multiple) meanings; for example, the same control may be used to cause a page printer to line feed or a card punch to "skip".

The ECMA members asked how the X3.2 code would handle punched cards if the present controls are not assigned dual (or multiple) meanings, since the Proposed American Standard Code does not contain punched card controls. It was pointed out by ECMA that if the controls do not have dual (or multiple) meanings and if full knowledge of the system does not exist, then controls for all types of media would have to be provided in the character set and included in data.

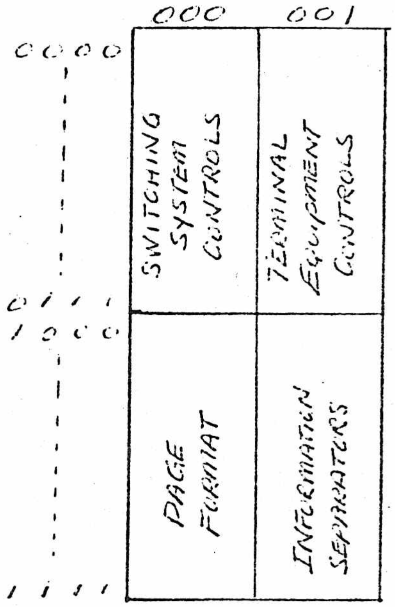
The X3.2 members agreed that ECMA had done a more thorough job in the control area and that a rearrangement of the controls in the 7-bit set is highly desirable. The controls in the first two columns of the 7-bit were classified as follows:

Switching System Control	Page Format	Information Separators	Terminal Equipment Control
SOM	CR	DD	RON
EOA	LF		ROFF
EOM	HT		XOFF
EOT	VT		MOFF
ACK	FF		
RU			
WRU			
NULL			

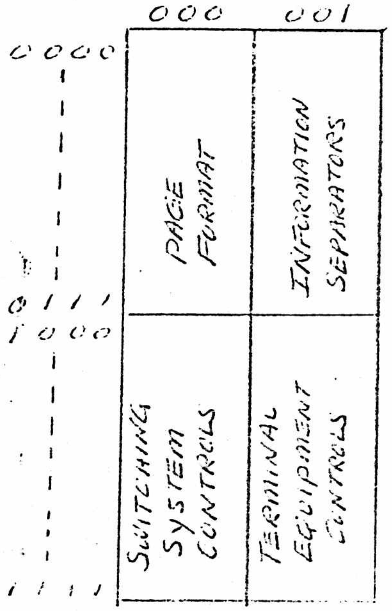
The placement and order of the page format controls were considered to be the only controls to which the committee need address themselves, since these were the only controls which appear in both the 6-bit and 7-bit sets.

Note: In addition to functioning as format controls, these controls would perform as information separators (or data delimiters) in the 6-bit set.

Two control arrangements were considered for the 7-bit set, as illustrated below:



(A)



(B)

The (A) structure requires the inversion of b_4 when communicating with a 6-bit processor, however, this was not supported by Dr. Lockemann, Chairman of ECMA TC-1, who favored adding the necessary inversion equipment at the centralized processor.

The X3.2 delegates favor the (A) structure for the following two reasons:

1 - It is desirable to have a one-bit difference between the data delimiters and the page format controls, and it is also of prime importance that the data delimiters be located so as to displace the least significant symbols of the graphic set in a 7-bit to 6-bit collapse.

2 - It is possible to reduce the number of alphabetic keys on keyboard devices which contain, in addition to a letter of the alphabet, two additional symbols if controls which are normally placed on separate keys (e.g., CR-LF-UC-LC) are placed in the lower half of the first column of the 7-bit set.

The 6-bit and 7-bit structures shown in Fig. 1 resulted from the following considerations:

1 - The British require a 4-bit subset with the following digits and symbols:

0 through 11

.	(multiply)
/	(divide)
-	(negative or subtract)
+	(plus or add)

2 - In addition to the above, ECMA considers the following symbols of sufficient significance to include in the 6-bit set:

( ) , * & % = ' ;

and a currency sign.

3 - The Cobol symbols should be provided. The following is a comparison of the symbols in the European Cobol set (information furnished by Siemens) and the USA Cobol set:

European	USA
+	+
-	-
*	*
/	/
=	=
$	$
,	,
.	.
(	(
)	)
'	;
	"
	<
	>

During the structing of the sets illustrated in Fig. 1, Mr. Ross suggested that consideration could very possibly be given to the elimination of the requirement for the digits 10 and 11 in the numeric stick. He stated that a specific code assignment for 10 and 11 was a "hangover" of the punched card, and that 10 and 11 are represented by two digits, viz., 1 and 0 and 1 and 1 for 10 and 11 respectively in tape and also internally in processors.

If the digits 10 and 11 are not required in the 6-bit set, it will be desirable to associate the semi-colon (;) with the comma (,) and the colon (:) with the period (.).

It was generally agreed, by the ECMA TC-1 members, that the question mark (?) could be replaced with the pound sterling (£) in the Sterling Monetary areas. However, one symbol, viz., the per cent sign (%), still remains in that portion of the 7-bit which will be displaced by the page format controls in the 6-bit collapse.

Mr. Ross also suggested that the 7-bit set contain a special graphic (≷) defined as "ignore error" and that this graphic be located at the bottom of the 6th column.

Mr. Gottlieb suggested that the two Cobol symbols, less than (<) and greater than (>), be removed from that portion of the 7-bit which is displaced by the page format controls in the 6-bit collapse and placed in the lower section of the graphic set. He did not specify where, nor did he explain why, since these symbols were not reported by Siemens as part of the European Cobol set.

Mr. Gottlieb asked permission to discuss the basic CIC structure of the ASA X3.2 proposal and to ask that a CI arrangement be considered to simplify the implementation of a 7-bit code in accounting machines. The point was discussed at length and it was agreed that X3.2 would submit its position in writing to Mr. Gottlieb. Mr. Gottlieb was the only ECMA TC-1 member to discuss the basic structure of the 7-bit code.

There was some discussion relating to the assignment of graphics to the last two columns of the 7-bit set. The X3.2 delegates explained that it was possible that the lower case would be assigned to this area.

Note: This is one argument against the adoption of Mr. Gottlieb's proposal.

It appears that Bull of Paris, France, is interested in a character set with both the upper and lower cases of the alphabet.

The transmission of data over the Telex network was explained by the ECMA members. The present plans are to arrange the Telex stations to "shift" to a data mode on the receipt of a sequence (e.g. FFFF or HHHH, etc.). In this mode data will be transmitted at the same character rate as present Telex messages. The result will be an increase in the bit rate from 50 baud to approximately 56.6 baud, this increase can be accommodated on the present network without change in facilities, providing of course that regenerative repeaters are not involved in the circuit. In the past, an increased bit rate has not been economically attractive, because the charges and bit rates have had a straight-line relationship. There is some evidence, however, that the charges may be adjusted to make it more attractive to go to higher bit rates.

The transmission of data over the telephone plant is not permitted at present. In addition, it is generally felt that the telephone plant must be improved before reliable data transmission will be possible.

JBBooth
J. B. Booth

March 14, 1962

	000	001	010	011	100	101	110	111
0000	NULL	RION	b̸	0	'	P		
0001		R2ON	!	1	A	Q		
0010	RU	XON	"	2	B	R		
0011	WRU	BELL	#	3	C	S		
0100	SOM	RIOF	@	4	D	T		
0101	EOA	R2OF	%	5	E	U		
0110	EOM	XOFF	<	6	F	V		
0111	EOT	MOFF	>	7	G	W		
1000		DD	(	8	H	X		
1001	HT	DD	)	9	I	Y		
1010	LF	DD	*	$	J	Z		
1011	VT	DD	,	:	K	↑		
1100	FF	DD	.	;	L	\		ACK
1101	CR	DD	/	?	M	←		
1110	UC	DD	-	=	N	[		ESC
1111	LC	DD	+	&	O	]		DELETE

(A)

00	01	10	11
b̸	0	'	P
HT	1	A	Q
NL	2	B	R
VT	3	C	S
FF	4	D	T
BS/CR	5	E	U
SO	6	F	V
SI	7	G	W
(	8	H	X
)	9	I	Y
*	$	J	Z
,	:	K	
.	;	L	
/	?	M	
-	=	N	ESC
+	&	O	ERS

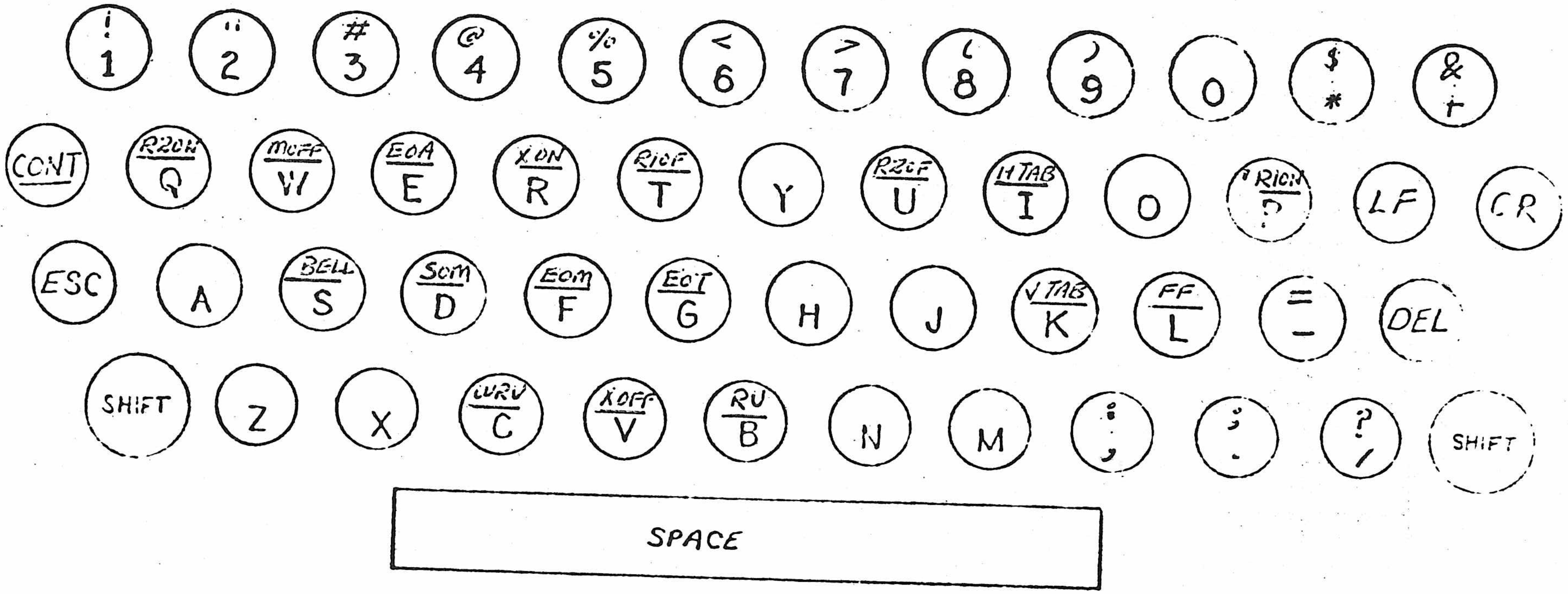
(B)

00	01	10	11

POSSIBLE 7-BIT SET WITH RELATED 6-BIT SET FOR INTERNATIONAL COMPATIBILITY

FIG. 1

3/12/62



POSSIBLE KEYBOARD ARRANGEMENT FOR TELETYPEWRITER RESULTING FROM THE POSSIBLE 7-BIT SET STRUCTURED FOR INTERNATIONAL COMPATIBILITY

3/12/62

FIG. 2

JBB

MARCH 4 —

MARCH 8-9 JOINT ECMA TC-1/ASA X 3.2 MEETING

—— mee ISO

APRIL 1 —

APRIL 8 ECMA TC-1 WORKING GROUP REPORTS
APRIL 11-13 ASA X3.2 MEETING

APRIL 24-26 ECMA TC-1 MEETING

MAY 6 — MAY 2-4 ISO/TC97 WORKING GROUP B MEETING

JUNE 3 —

JUNE 9 - MATERIAL TO MEMBERS OF ISO/TC97

JULY 1 — JULY 1 X3 BALLOT DUE (ASCII)

AUGUST 5 —

SEPT. 2 —

OCT. 7 — OCT 9-18 ISO/TC97 MEETING

NOV. 4 —

INTERNATIONAL INFORMATION INTERCHANGE CODE

SCHEDULE OF ACTIVITIES

TABLE 1

JBB
3/12/62

Bemer

March 22, 1962

MR. K. J. AMOS, Technical Manager
Creed and Company Limited
Telegraph House
Croydon, England

Dear Mr. Amos:

Thank you for your letter of March 5, 1962. Unfortunately I will not be at the Geneva meeting of the C.C.I.T.T. and, so far as I know, no one will be there reporting on the code development in the U.S.A. However, if Mr. McGregor Ross is present, he will certainly have most of the story. If I can send you or Mr. Rhodes any further data, please let me know. Also, I should appreciate a note from you if anything significant develops on the code subject at that meeting.

With regard to your question as to timing intervals associated with "Who Are You" and "Answer Back". In our line-switched service, the answer back mechanism is provided with a time delay equal to one character length, measured from the initiation of the trip signal. This trip signal is generated in the stunt box of the queried printer on receipt of the "Who Are You" code.

This delay is for the purpose of non-contention with a fill character that may follow the "Who Are You" signal from a distant transmitter, rather than for operation of a send-receive switch. To further explain, we provide for the use of the "Who Are You" signal in tape transmission. In such cases, the fill character is used to time out the operation of the Model 28 typing unit associated with the tape transmitter until that printer is able to interpret the "Who Are You" signal as "transmitter stop". (Because the recognition and execution of transmitter stop at the transmitting end is not instantaneous, the fill character is required.) In such operation, the last character of the answer back restarts the tape transmitter.

NMAH 310/3

In actual practice something less than a full character delay, depending on propagation time, would be sufficient; however an economical solution in the answer back mechanism is to employ an integral character length.

Yours very truly

BGG:JS

Director of Product Development

creed

DATA PROCESSING GROUP

Creed & Company Limited

TELEGRAPH HOUSE · CROYDON · SURREY

Telephone MUNicipal 2424
Telegrams Credo Telex Croydon
Telex 28836

AIR MAIL

Our ref KJA/EMH

5th March, 1962.

3/8

Mr. J.F.Auwaerter,
Director of Product Development,
Teletype Corporation,
5555 Touhy Avenue,
Skokie, Illinois,
U. S. A.

Dear Mr. Auwaerter,

Thank you for your letter of the 20th February, from which I am glad to learn that the trip from your point of view was worthwhile.

In this connection, I had wondered if I should be having the pleasure of seeing you at the forthcoming C.C.I.T.T. Working Party in Geneva dealing with the question of operation at more than 50 bauds. I know that this question theoretically only concerns operation within C.C.I.T.T. alphabet No.2, but my own feeling is that the Working Party discussion will broaden in relation to new alphabets as well as new speeds. As you did not mention it in your letter, however, I assume that you will not be coming yourself and that your point of view will be put forward by one or other of the American delegates.

I would also like to take this opportunity of raising a problem with you on which I would be grateful if you could advise me. It deals with the question of the operation of Send/Receive switch which as you know we use quite a bit in Europe in relation to polar operation. It is generally desirable for the Send/Receive switch to have a delayed return to the receive side to avoid unnecessary arcing when operating at cadence speed or below, but the timing of this return to receive can be critical in relation to the operation of the Answer Back Unit. I wonder, therefore, if you could let me know exactly what the time interval is on your equipment, both the T.28 and the new models on which I assume an Answer Back is provided, between the receipt by a machine of the last code impulse of the Who are You signal and its transmission from its Answer Back Unit of the start signal of the first answer back character transmitted. Over here in certain cases we impose an artificial delay on the actual commencement of the first Answer Back signal which arises, partly from the need to give echo suppressors time to reverse. However, as I have said above, it also has a bearing on the time in which the Send/Receive switch returns to receive, and I am therefore interested in the minimum figure and I believe that at least on the T.28 that there is no artificial delay imposed on the operation of the Answer Back Unit, but I would certainly appreciate it if you could give me the exact timing.

Yours sincerely,

KJ Amos

Use of "Escape" Character to Enlarge the Control-Code Capacity of the 7-Bit Code - File 37729 and 39065

March 26, 1962

ABSTRACT

The new 7-bit code for 4-row keyboard operation has 33 codes assigned to control functions. However, the immediate and the probable future demand for more control codes will exceed by a large amount the available unassigned code positions. This memorandum lists the known requests for more code assignments. Methods are described by which the Escape character might be used, together with other characters, to create a large number of additional control combinations.

CBI 69/1/3

BELL TELEPHONE LABORATORIES
INCORPORATED

SUBJECT: Use of "Excape" Character to Enlarge the Control-Code Capacity of the 7-Bit Code - File 37729 and 39065

DATE: March 26, 1962

FROM: A. L. Whitman

MEMORANDUM FOR FILE

In the new 7-bit code for use with the 4-row keyboard there are 25 assigned control characters (for purposes of this memorandum Null and Delete are defined as control codes), together with eight "Data Delimiters" which have not been precisely defined but which are reserved for use by data processors and so are not considered usable for communication controls.

There are left five unassigned code positions, two in Column 1, one in Column 7 and two in Column 8; these are shown in Fig. 1, attached. (The remaining 26 positions in Columns 7 and 8 are considered unavailable, pending final determination as to whether or not they are to be used for a lower-case alphabet.)

Attached to this memorandum are three tables, 1, 2, and 3, listing requests for 23 code assignments which have actually been asked for. It is to be expected that many more such requests will be made as wider uses for the code are discovered in the future.

In addition, an entry such as that on Table 3, "Code for Remote Control of Equipment such as Valves, Switches, etc." might require expansion to a large number of separate codes where there were a number of devices requiring separate codes with possibly two or more types of operation of each device.

Comparison of the possible future demand with the available supply makes it clear that only a small portion of the possible requests can be made by the assignment of single discrete control characters. Three possible ways to create more control codes are:

1. The use of sequences of characters that are unlikely to appear inadvertently in transmitted material. This solution gets complicated and difficult when encrypted material is involved.

2. The programming of message format so that the functions of certain characters depend on their position in the message. An example is in teletypewriter selective calling systems, where combinations of letters of the

alphabet which appear in the format between the disconnect signal and the end-of-address signal are interpreted as control codes to cut on called stations.

3. The use of the Escape character as a "gate" or mode shifter so that one or more characters sent after the Escape character have meanings different from their meanings when the system is in the normal mode. For example, with the system in the Escape mode letters of the alphabet might be used to perform control functions.

The rest of this memorandum describes various ways in which the Escape mode might be used. In general, there are two similar but somewhat different basic methods of operation, as follows:

1. Following the Escape character, the system remains in the Escape mode for a specified number of characters, after which it automatically reverts to the normal mode.

2. Following the Escape character, the system remains in the Escape mode until a subsequent signal combination restores it to the normal mode.

Definition of the Normal Mode in this Memorandum

To make clearer the descriptions of the uses of the Escape mode which follow, illustrative examples are given. In these it will be assumed that the normal mode is one in which printing takes place on the teletypewriters of the system and that printing is suppressed in the Escape mode. This is entirely for illustrative purposes and is not intended to limit the uses of either the normal or the Escape mode. In systems, for example, where printing was not involved, the differences between the normal mode and the Escape mode might have to do with differences of types of functions. Since no present applications of this sort are definitely known, this aspect will not be pursued further.

Use of Escape Mode with Automatic Reversion to Normal Mode

One way, indicated above, to use the Escape character is to follow it by a single other character, or by a sequence of two or more characters for control purposes. The Escape character alone might put the system in the Escape mode so that, in the case postulated, the subsequent characters assigned as controls might be selected from the graphic set, possibly one or more letters of the alphabet. Thus different groups of letters might be used to perform different operations or to perform the same operation at different stations.

The last one of the sequence of characters selected as Escape Controls would automatically restore the system to the normal mode and printing would resume.

Danger of Lockout of Printing

If the Escape character alone puts the system in the nonprinting mode, and if the return to the printing mode requires a particular sequence of characters, there is danger that garbling of any one of the letters of the sequence might leave the system in the nonprinting mode, without the knowledge of the attendants, so that messages would be lost.

To guard against this hazard, it is suggested that the receiving printing machines might be arranged so that after a specified number of characters (following Escape), regardless of what the characters were, the machines would automatically revert to the printing condition.

Variable Numbers of Control Characters Following Escape

In some cases it may be desirable, on the same network, to use sequences of control characters (following the Escape character) with different numbers of characters. Caution must be used to avoid the duplication of letters in sequences of different lengths. For example, if the sequence Escape ABC is used, the sequence Escape A cannot be used for another functional operation. This is because if Escape ABC were sent, the Escape A portion of the sequence would also cause its assigned function.

A way to avoid this is to end all sequences with a control character, with the equipment so arranged that the desired action does not take place until the control character is received. By this device the sequence Escape ABC (Control Character) would operate independently of the sequence Escape A (Control Character) and no inadvertent false operation would result.

As an illustrative example, suppose that it is desired to send from an originating tape the control signals needed to start a remote transmitter at a station designated ABC. For security reasons, and to prevent the pickup of this tape from an unauthorized station, the remote station is so arranged that the arrival of its code, ABC, is essential to start the transmitter. The originating station sends from its tape the following sequence:

Escape ABC XOFF Delete

The code XOFF is to stop the originating transmitter to allow the remote transmitter to send. The code delete is for timing purposes, to give the originating transmitter time to stop before the remote transmitter starts. The transmitted sequence turns on the remote transmitter.

Lock-In of Escape Mode until Release by Subsequent Signal

Another possible use of the Escape character (usually followed by one or more other characters to make up a control sequence) would be to lock the system in an Escape mode where it would remain until a subsequent control sequence restored it to the normal mode. For example, the combinations Escape E and Escape F, respectively, might be used to go into and out of the mode.

It is suggested that it is hazardous to use the same character (or characters) to go into, and to come out of, the Escape mode. This is because if two connected stations should inadvertently get out of step, so that one was in the Escape mode and the other in the normal mode, they could not be brought back into step by repetitions of either the exit or the entry Escape combination. The special measures required to restore the system to normal might be beyond the capability of operators and require the services of a maintenance man.

NY-3112-ALW-TM　　　　ALLEN L. WHITMAN

Att.
Tables 1, 2, 3
Fig. 1

TABLE 1

Additional Control Character Assignments
Suggested by X3.3 Subcommittee

1. "Idle" code, for synchronous systems, with transitions (not Null or Delete)
2. "Escape" code not a "hit" character Escape 1.
3. Repeat Request Code (equivalent to ARQ). Escape 2.
4. Mode change code -- voice-to-data or data-to-voice

Total 4 codes

Table 2

Additional Data Processing Control Characters

Requested by a Member of X3.2 Subcommittee

1. Data Message
2. Last Resort Data Message
3. Request for Retransmission (different from ARQ)
4. ACK 1) in addition to WADS ACK
5. ACK 2)
6. Main Alarm
7. Line Good
8. Take Over
9. Alert
10. Alert Acknowledge
11. Klaxon
12. No Message (not Null or Blank - use Item 1, Table 1)
13. Initiate Rerouting
14. Last Old Routing
15. End of Block (use one of Data Delimiters)
16. Status Message
17. Start of Message - Priority

Total 15 Codes (with duplications omitted)

Table 3

Additional Communication Control Characters

Wanted by Bell System

1. Control of remote transmitter (Different from X ON)
2. Code to cause change to Tape-to-Tape mode. Suppressing printing when "foreign" tapes are sent
3. Code for remote control of equipment such as valves, switches, etc. (There could be a large number of codes required here for various types of operation)
4. Code to request information from special devices (such as for computer applications and telemetering -- there could be a large number of codes required here for selecting desired items of data)

Total 4 codes

RECOMMENDED CHARACTER SET FOR 4-ROW TELETYPEWRITERS

			b7	0	0	0	0	1	1	1	1
			b6	0	0	1	1	0	0	1	1
			b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1								
0	0	0	0	NULL	RION	SP	0	!	P	↑	↑
0	0	0	1	SOM	R2ON	'	1	A	Q	U	U
0	0	1	0	MOFF	XON	"	2	B	R	N	N
0	0	1	1	RU	EOA	<	3	C	S	A	A
0	1	0	0	WRU	RIOF	>	4	D	T	S	S
0	1	0	1	EOT	R2OF	$	5	E	U	S	S
0	1	1	0	HTAB	XOFF	%	6	F	V	I	I
0	1	1	1	FF	EOM	&	7	G	W	G	G
1	0	0	0	VTAB	↑ DATA DELIMITERS ↓	(	8	H	X	N	N
1	0	0	1			)	9	I	Y	E	E
1	0	1	0	BELL		.	↑	J	Z	D	D
1	0	1	1			,	←	K	@		↓
1	1	0	0	CR		*	+	L	\		ACK
1	1	0	1	LF		:	;	M	[		
1	1	1	0	UC		−	=	N	]		ESC
1	1	1	1	LC		/	?	O	#	↓	DEL
						← GRAPHICS →					
COLUMNS →				1	2	3	4	5	6	7	8

Fig. 1

Changes in 7-Bit Code for 4-Row
Teletypewriters.

April 2, 1962

Allen L. Whitman

MR. W. T. REA:

The X3.2 Subcommittee at its regular meeting in Chicago on April 11-13 will consider the possibility of making changes in the proposed American Standard Code as a result of comments received. While it is not clear that any possible changes could be solid enough to justify the Bell System in changing the present structure, at least this is the last minute at which such changes could be considered at all.

With reference to your comments on the placing of the graphics in particular the symbols above the numerals on the top keyboard, I have worked out a proposal which is attached to this memorandum. In accordance with your views I have tried to achieve the following:

1. Symbols on the top row of keys such as typists are used to rather than mathematical symbols.
2. A keyboard which might be used identically for monocase and UP-LO operation. The differences being that UP-LO operation would require the abandonment of the UP-LO key top symbols over the letters K, M, N, O and P and over the period and the comma.

I would very much appreciate your comments on this layout as a guide to what we should urge on the Subcommittee on next weeks meeting.

Attached is a keyboard chart and a summary of the graphic characters of the set. I have not shown the control characters on the charts.

Original Signed
by

NY-3112-ALW-CP

ALLEN L. WHITMAN

Att.
As above

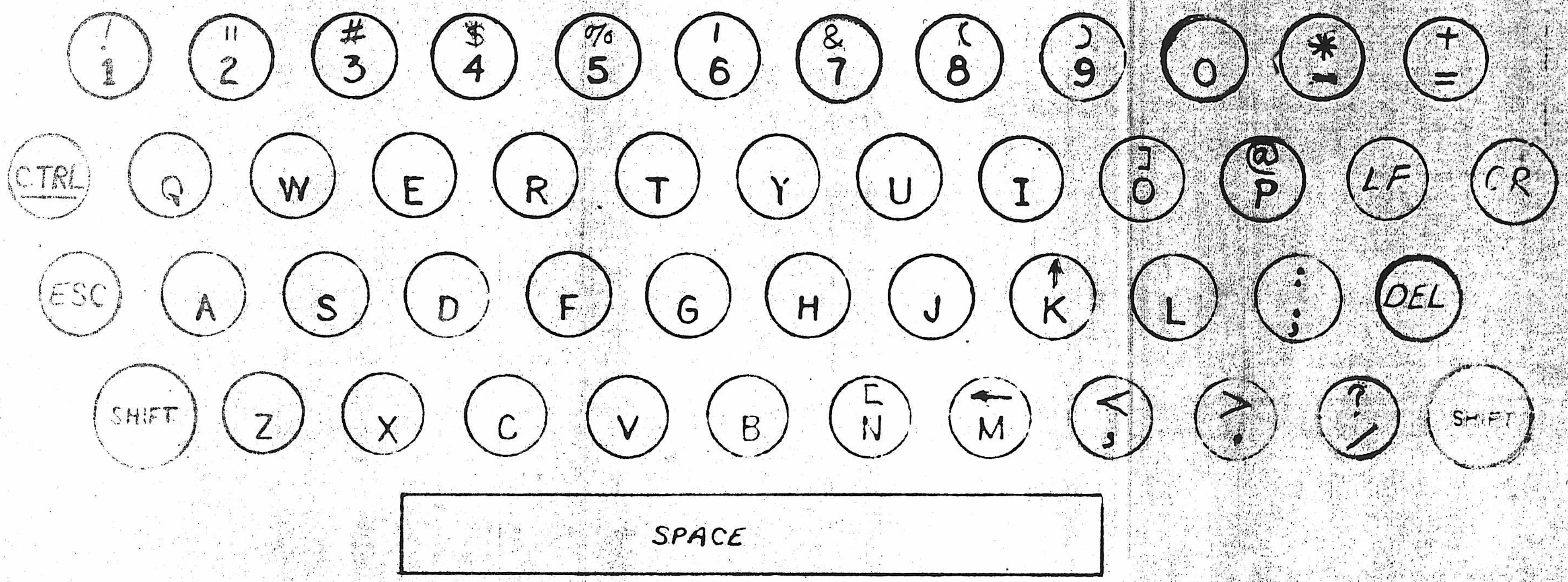
Copy to
Messrs. J. R. Harris - MH
T. L. Dimond - MH
J. B. Booth - Teletype Corp.
J. F. Auwaerter - Teletype Corp. ← THIS COPY FOR

COPY
BELL TELEPHONE LABORATORIES
INCORPORATED

E-211 (12-54)

NMAH 310/3

Proposed 4-Row Keyboard for Monocase and UP-LO Teletypewriter



Notes:

1. Upper Keytop CTRL symbols not shown.
2. The following symbols would not appear on an UP-LO keyboard:

] @ ↑ [← < >

JBB
ALW
3-23-62

GN-551-2 (12-55)

Graphic Set for

Keyboard for Monocase and UP-LO Teletypewri

3	4	5	6
Sp	0	@	P
!	1	A	Q
"	2	B	R
#	3	C	S
$	4	D	T
%	5	E	U
'	6	F	V
&	7	G	W
(	8	H	X
)	9	I	Y
.	>	J	Z
,	<	K	↑
=	+	L	\
;	:	M	←
-	*	N	[
/	?	O	]

Note: For UP-LO keyboard, abandon all upper-symbol characters above alphabet letters and above comma and period, as follows:

> < @ ↑ \ ← [ ]

Basic to Numeric Column:

. , - /

ALW
3-23-62

April 17, 1962

MR. V. N. VAUGHAN, Jr.
Data and Teletypewriter Planning Engineer
AT&T Company
195 Broadway
New York 7, New York

Dear Mr. Vaughan:

We have been proceeding with the design of WADS equipment based on a proposed new American Standards Association (ASA) data interchange code. Because of a recent reversal of position by IBM it now appears that there may be no single standard data interchange code. This requires a prompt decision by the Bell System - to either continue on our present course or to change. The following choices appear before us:

I. Continue with the ASA Proposed Code

The ASA proposed code is logically designed for use within computers and in communication systems. It is compatible with European thinking and economics. It has a very serious fault, however, in that it is not easily converted to the punched card code. Until a few months ago it appeared that this code would be universally accepted and would provide an excellent data interchange code. IBM has recently reversed its position from support to opposition and now advances its own code ("Hollarith") as a proposed ASA standard. It is considered certain that the ASA designed code will not be accepted as a universal standard. The present outlook is for a dual standard with both IBM and ASA codes approved.

WADS equipment is now in manufacture based on the ASA code. If Bell continues on this course it is quite certain that the code will become *an* ASA and international standard. The disadvantage lies in the fact that WADS and TWX stations are not suitable for direct input and output with IBM coded systems. This may require a separate "universe" of IBM compatible WADS and TWX stations.

NMAH 310/3

II. Change to the IBM Code

The IBM code is now in extensive use as a data interchange code. It converts easily to the IBM punched card code. IBM will continue to use this code - has disowned and now opposes the ASA proposed code.

The IBM code is not well designed for use inside a computer - it requires some translation. The IBM code does not provide a good typewriter keyboard and, although usable, is not fully satisfactory for message communication service. It does not permit easy addition of up-lo. We expect European communicators and data processors to oppose this code.

If Bell adopts the IBM code, a national standard will be immediately and firmly established. This will perpetuate for many years, perhaps forever, a code which is awkward both for communication and processing purposes. It will, however, stimulate business in data communication and interchange.

Europeans and some domestic companies will be very unhappy - may charge collusion. Long range result may be something like the British-Metric standards conflict.

III. Return to Baudot

The Bell System is at a disadvantage with either the IBM or ASA codes because of incompatibility with present 5 unit communication code standards.

If neither of these offer sufficient hope of becoming a true standard, a return to a Baudot oriented code (8 unit) will at least avoid the cost and confusion of internal code differences.

Such a code will never be standard for data processors but could become an international communications standard. With this code, when communication companies try to offer data originating or terminating stations, their standard offerings cannot be used. With a special offering using a processors code they have no advantage over an individual data processor/communicator. Adding a translator at each station is a great disadvantage. With a Baudot oriented code, there appears to be no possible escape from this situation.

A review of these choices indicates that there is a short range advantage in going to the IBM code in that the Bell plant will then definitely conform to a universal interchange standard. This advantage is partially offset by a short range disadvantage; namely, that such a major change would delay deliveries of equipment for the WADS and TWX programs. For the long-range, the IBM code will result in a poorer overall service.

We favor continuing with the present program using the ASA code even though it appears much less attractive than it did originally. In spite of the present very serious set-back, there is a reasonably good chance that this code in the long run may become a universal standard because of its inherent good qualities. This code has received universal technical endorsement (including IBM) and suffers only from incompatibility with punched card code. It is possible that this disadvantage will diminish with time. This lack of compatibility with punched cards will be with us as a problem for many years. We think it is a very serious problem. The alternate choice however is even less attractive.

Please let us have your comments as soon as possible.

Yours very truly

ORIGINAL SIGNED BY
W. J. ZENNER

Vice President

WJZ:AC

Copy to:
Mr. W. T. Rea - BTL
Mr. J. H. Felker - AT&T
Mr. R. R. Hough - AT&T
Mr. M. T. Goetz - Teletype

1401, 1410, 7040 and 7044 DATA PROCESSING SYSTEMS BULLETIN

STANDARD BCD INTERCHANGE CODE

The Standard BCD Interchange Code defines for the IBM Corporation a standard 64-character set for the IBM 1401, 1410, 7040, and 7044 Data Processing Systems. The code provides compatibility of data for interchange among all systems using this standard. The standard provides a consistent definition of:

1. IBM Card Code
2. IBM BCD Magnetic Tape Code
3. Relation between these codes and printed symbols (graphics)
4. Relation between these codes and machine control codes
5. Collating sequence of code elements
6. Two subsets of alternate graphics

In addition, the standard provides uniform graphics for publications. Existing published material will be changed to reflect the standard BCD interchange code.

Figure 1 is a chart of the standard BCD interchange code. Column 2 shows the graphics for the 64 code elements. The equivalent card and BCD codes are shown by columns 3 and 4. The collating sequence of the 64 code elements is indicated in column 1 by a collating number which runs from 00 (low) to 63 (high).

Five of the code elements have an interchangeable set of graphics (Figure 2). For example, the special characters % and (have the same card and BCD code. The actual graphic printed for any one character code depends on the graphics supplied with the printing device. Graphic subset 1 (print arrangement A) is made available for report writing. Graphic subset 2 (print arrangement H) is made available for programming language use.

Seven of the 64 code elements are control codes (Figure 3). The code structure for these control characters remains the same as before. The segment mark and word separator codes have new graphics. The substitute blank is used for a blank (no bits) in even parity systems that have only 63 code elements.

Two code elements with special meaning are shown in Figure 4.

Figure 5 is a summary of the differences between the present 1401-1410 codes and the standard BCD interchange code.

NMAH 310/3

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Address comments regarding this bulletin to:
IBM Corporation, Customer Manuals, Department 298, P.O. Box 390, Poughkeepsie, New York

1 Collating Number	2 Graphics	3 Card Code			4 BCD Code						5
					B	A	8	4	2	1	
00	Blank	No Punches			No Bits						
01	.	12	3	8	B	A	8		2	1	
02	⌑)	12	4	8	B	A	8	4			
03	[	12	5	8	B	A	8	4		1	
04	<	12	6	8	B	A	8	4	2		
05	⯒	12	7	8	B	A	8	4	2	1	GM
06	& +	12			B	A					
07	$	11	3	8	B		8		2	1	
08	*	11	4	8	B		8	4			
09	]	11	5	8	B		8	4		1	
10	;	11	6	8	B		8	4	2		
11	Δ	11	7	8	B		8	4	2	1	MC
12	-	11			B						
13	/	0	1			A				1	
14	,	0	3	8		A	8		2	1	
15	% (	0	4	8		A	8	4			
16	Y	0	5	8		A	8	4		1	WS
17	\	0	6	8		A	8	4	2		
18	⧻	0	7	8		A	8	4	2	1	SM
19	ƀ		2	8		A					SB
20	# =		3	8			8		2	1	
21	@ '		4	8			8	4			
22	:		5	8			8	4		1	
23	>		6	8			8	4	2		
24	√		7	8			8	4	2	1	TM
25	?	12	0		B	A	8		2		PZ
26	A	12	1		B	A				1	
27	B	12	2		B	A			2		
28	C	12	3		B	A			2	1	
29	D	12	4		B	A		4			
30	E	12	5		B	A		4		1	
31	F	12	6		B	A		4	2		
32	G	12	7		B	A		4	2	1	
33	H	12	8		B	A	8				
34	I	12	9		B	A	8			1	
35	!	11	0		B		8		2		MZ
36	J	11	1		B					1	
37	K	11	2		B				2		
38	L	11	3		B				2	1	
39	M	11	4		B			4			
40	N	11	5		B			4		1	
41	O	11	6		B			4	2		
42	P	11	7		B			4	2	1	
43	Q	11	8		B		8				
44	R	11	9		B		8			1	
45	‡	0	2	8		A	8		2		RM
46	S	0	2			A			2		
47	T	0	3			A			2	1	
48	U	0	4			A		4			
49	V	0	5			A		4		1	
50	W	0	6			A		4	2		
51	X	0	7			A		4	2	1	
52	Y	0	8			A	8				
53	Z	0	9			A	8			1	
54	0		0				8		2		
55	1		1							1	
56	2		2						2		
57	3		3						2	1	
58	4		4					4			
59	5		5					4		1	
60	6		6					4	2		
61	7		7					4	2	1	
62	8		8				8				
63	9		9				8			1	

Figure 1. Standard BCD Interchange Code

BCD Code	8-2-1	8-4	A-8-4	B-A	B-A-8-4
Graphic Subset 1 Print Arrangement A	#	@	%	&	⌑
Graphic Subset 2 Print Arrangement H	=	'	(	+	)

Figure 2. Graphic Subset 1 and 2

Control Characters	Graphic	BCD Code	Card Code
GM: Group Mark	⯒	B-A-8-4-2-1	12-7-8
TM: Tape Mark	√	8-4-2-1	7-8
SM: Segment Mark	⧻	A-8-4-2-1	0-7-8
MC: Mode Change	Δ	B-8-4-2-1	11-7-8
RM: Record Mark	‡	A-8-2	0-2-8
SB: Substitute Blank	ƀ	A	2-8
WS: Word Separator	⋎	A-8-4-1	0-5-8

Figure 3. Control Characters and Graphics

Character	Graphic	BCD Code	Card Code
MZ: Minus Zero	!	B-8-2	11-0
PZ: Plus Zero	?	B-A-8-2	12-0

Figure 4. Minus and Plus Zero

Standard BCD Interchange Code				Present Graphics	
Card Code	BCD Code	Graphic A	Graphic H	1410	1401
3-8	8-2-1	#	=	#	#
4-8	8-4	@	'	@	@
2-8	A	ƀ	ƀ	¢	‡ or ¢
0-4-8	A-8-4	%	(	%	%
0-5-8	A-8-4-1	⋎	⋎	=	=
0-6-8	A-8-4-2	\	\	'	'
0-7-8	A-8-4-2-1	⧻	⧻	"	"
11-0	B-8-2	!	!	!	- or !
11-5-8	B-8-4-1	]	]	)	)
12	B-A	&	+	&	&
12-4-8	B-A-8-4	⌑	)	⌑	⌑
12-5-8	B-A-8-4-1	[	[	(	(

Figure 5. Code Summary Comparison

All IBM 1401, 1410, 7040 and 7044 Data Processing Systems shipped after June 15, 1962 will conform to the standard BCD interchange code. Systems installed or shipped prior to this date may be converted to the standard BCD interchange code by requesting a no-charge MES. Conversion to the standard BCD interchange code requires the following changes:

> IBM 1401 Data Processing System: Providing an expanded type style A or H for the Console Printer of the 1407 Model I Inquiry Station. Note: The 1402 (1401 system) will not translate between an A-bit BCD code and the 2-8 card code. If translation is required, consult the Regional Special Equipment Department.
>
> IBM 1410 Data Processing System: Providing the IBM 1415 Console Printer with two type heads and 11 key-tops. This allows the system to incorporate the two graphic subsets, printing arrangements A and H.

IBM®
International Business Machines Corporation
Data Processing Division, 112 East Post Road, White Plains, N. Y.

Printed in U.S.A.

RECOMMENDED CODE FOR INFORMATION INTERCHANGE
FOR CONSIDERATION BY ISO
TC97 WORKING GROUP B
(BASED ON DISCUSSION AT APRIL ASA X3.2 MEETING)

– [illegible] 1962

ATTACHMENT J

b7 →				0	0	0	0	1	1	1	1
b6 →				0	0	1	1	0	0	1	1
b5 →				0	1	0	1	0	1	0	1
b4	b3	b2	b1								
0	0	0	0	NULL	①	b̸	0	@	P		
0	0	0	1	EOT	STOP	'	1	A	Q		
0	0	1	0	EOM	DC3	"	2	B	R		
0	0	1	1	EOA	DC2	!	3	C	S		
0	1	0	0	SOM	DC1	#	4	D	T		
0	1	0	1	WRU	①	%	5	E	U		
0	1	1	0	RU	ERR	$	6	F	V		
0	1	1	1	BELL	EOB	&	7	G	W		
1	0	0	0	TC1	LEM	(	8	H	X		
1	0	0	1	F.F.	S4	)	9	I	Y		
1	0	1	0	V.T.	S3	:	;	J	Z		
1	0	1	1	L.F.	S2	*	+	K	[		
1	1	0	0	H.T.	S1	,	<	L	\		ACK
1	1	0	1	CR	So	.	>	M	]		①
1	1	1	0	①	S.O.	-	=	N	↑		ESC
1	1	1	1	①	S.I.	/	?	O	←		DEL

← GRAPHICS →

①	RESERVED FOR CONTROLS
TC1	TRANSMISSION CONTROL 1
ERR	ERROR OR VOID
EOB	END OF BLOCK
LEM	LOGICAL END OF MEDIA
Sn	DATA DELIMITERS
S.O.	SHIFT OUT
S.I.	SHIFT IN

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ALL OTHER ABBREVIATIONS ARE THE SAME AS SHOWN IN PROPOSED AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE DATED 10 NOVEMBER 1961

	SPACE	0			P	
S1	H. TAB	1		A		
S2	N.L.	2				
S3	V. TAB	3				
S4	F.F.	4				
	UNDEFINED	5				
	SHIFT OUT	6				
	SHIFT IN	7				
	S	8				
	Y	9				
	M	10	$		Z	
	B	11	;		SK	&
	O				SK	@
	L				SK	
	E				ESCAPE	
	S			O	ERASE	

The special signs accepted are :

+ - . , / * ( )

Their positions is not defined exactly but it appears to be agreed that the signs . - / should be placed at the lower end of the first column.

ECMA's [illegible]

(6-BIT COMP[illegible])

MAY 4, [illegible]

JRB

7-BIT SET

NULL		ƀ	0	@	P		
EOT	DC4 (STOP)	!	1	A	Q		
EOM	DC3	"	2	B	R		
EOA	DC2	#	3	C	S		
SOM	DC1	$	4	D	T		
WRU	ERROR	%	5	E	U		
RU	SYN	&	6	F	V		
BELL	EOB	'	7	G	W		
FE5	S5	(	8	H	X		
FF	S4	)	9	I	Y		
VT	S3	:	*	J	Z		
LF	S2	;	+	K	[		
HT	S1	,	<	L	\		ACK ②
CR	S0	-	=	M	]		
SO		.	>	N	↑		ESC
SI		/	?	O	←		DEL

RELATED 6-BIT SET

NULL	0	@	P
FF	1	A	Q
VT	2	B	R
NL	3	C	S
HT	4	D	T
ƀ	5	E	U
SO	6	F	V
SI	7	G	W
(	8	H	X
)	9	I	Y
:	*(10)	J	Z
;	+(11)	K	①([)
,	$(<)	L	①(\)
-	%(=)	M	①(])
.	&(>)	N	ESC
/	'	O	DEL

① SCANDINAVIAN EXTENSION

② NOT INCLUDED AT ISO TC/97 W.G. B MAY MEETING

PROPOSAL A
ISO TC/97 W.G. B
MEETING OF
MAY 2-4, 1962

5/4/62
JBE

7 BIT SET

	000	001	010	011	100	101	110	111
0000	NULL	DC_0	ƀ	0	@	P		
0001	SOM	DC_1	!	1	A	Q		
0010	EOA	DC_2	"	2	B	R		
0011	EOM	DC_3	#	3	C	S		
0100	EOT	DC_4 (STOP)	$	4	D	T		
0101	WRU	ERROR	%	5	E	U		
0110	RU	SYN	&	6	F	V		
0111	BELL	EOB	▼	7	G	W		
1000	FE_0	S_0	(	8	H	X		
1001	HT	S_1	)	9	I	Y		
1010	LF	S_2	:	*	J	Z		
1011	VT	S_3	;	+	K	[		
1100	FF	S_4	,	<	L	\		ACK ②
1101	CR	S_5	-	=	M	]		
1110	SO	S_6	.	>	N	↑		ESC
1111	SI	S_7	/	?	O	←		DEL

RELATED
6 BIT SET

00	01	10	11
ƀ	0	NULL / @	P
HT	1	A	Q
NL	2	B	R
VT	3	C	S
FF	4	D	T
FE_5	5	E	U
SO	6	F	V
SI	7	G	W
(	8	H	X
)	9	I	Y
:	*(10)	J	Z
;	+(11)	K	①([)
,	$(<)	L	①(\)
-	%(=)	M	①(])
.	&(>)	N	ESC
/	▼	O	DEL

① SCANDINAVIAN EXTENSION — [illegible]

② NOT INCLUDED AT ISO TC/97 W.G B MAY MEETING

PROPOSAL B
ISO TC/97 W.G. B
MEETING OF
MAY 2-4-1962

5/4/6
JEC

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e Normalisation (AFNOR)
3, rue N.D. des Victoires
AR 2e
él. GEN.95-80

ORGANISATION INTERNATIONALE DE NORMALISATION
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO/TC 97/GT B
(PARIS 1) 9
2 mai 1962

ISO/TC 97/GT B
JEUX DE CARACTERES ET CODAGE
Secrétariat : FRANCE

Réunion du 2 au 4 mai 1962 à PARIS

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.../...

FG/mam
Arc.:368 E

---

* On a souligné le nom du Chef de délégation.
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NMAH 310/3

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I S O
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION

ISO/TC 97/WG B
CHARACTER SETS AND CODING
Secretariat :
FRANCE

ISO/TC 97/WG B
(Sec.1) 1 E
February 1962

Voir le français au dos

ISO/TC 97 COMPUTERS AND INFORMATION PROCESSING

WG B CHARACTER SETS AND CODING

Meeting to be held 2-4 May 1962
in AFNOR premises 45, rue Vivienne, PARIS 2°

DRAFT AGENDA

	Documents ISO/TC 97 WG B
1 - Opening of the meeting	
2 - Roll call of delegates	
3 - Election of Chairman	
4 - Appointment of a drafting committee	
5 - Approval of draft agenda	(Sec.1)1
6 - Report of the Secretariat on the activity of the group since it was created in GENEVA	(Sec.2)2 1st part.
7 - Basic documents gathered by the Secretariat	(UK 1)3 (USA 1)4
8 - First elements of an international agreement in the field of character sets	(Sec.2)2 2nd part.
9 - Vote of the resolutions	
10 - Date and place of the next meeting	
11 - Closure of the meeting	

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ISO/TC 97 COMPUTERS AND INFORMATION PROCESSING

WG B CHARACTER SETS AND CODING

A - ACTIVITIES OF GROUP B SINCE ITS CONSTITUTION AT GENEVA

At the request of the Secretariat of Committee ISO/TC 97 (USA), the Secretariat of Group B has examined the projected scope and the minutes of the 1st meeting of Group B, and signified its approval of them.

The Secretariat participated in a meeting of Committee CEI/TC 53 held in London in November 1961.

AFNOR has constituted its "commission française de normalisation internationale des Calculateurs et du traitement de l'information", which has set up a Group B "Character Sets and Coding", which corresponds to Group ISO/TC 97/WG B : this French Group B acts as technical adviser to the Secretariat of the International Group B.

On 11th July 1961, AFNOR requested Member-countries : Germany, Italy, United Kingdom, U.S.A. to supply it, if possible before 20th September, basic items of information.

Answers

United-Kingdom : On 20th September 1961, the BSI sent as a working basis :
- UK Specification for Data processing codes for punched tapes;
- British Standard BS 3174:1959 Alphanumeric Punching code for data processing cards.

Germany: On 20th September 1961, the DNA confirmed its participation in Group B, and named two delegates. It regretted not to be able to send either Standards or documentation.

United States : On 20th December 1961, Mr. MACON, Chairman of Group X3-2 of the ASA, sent to the Secretariat the proposed American Standard "Code for information interchange" with its appendices.

Italy : The UNI has not replied.

By a letter dated 11th October 1961, AFNOR also requested working elements from the various organisations which had taken part in the round table discussion (Geneva, May 1961), viz. : IFAC, UIT, CPCIA, UIC, FID, ECMA, CEI, IFIPS, CIC, AEEB.

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None of these organisations supplied any technical elements, properly speaking. However :

- IFIPS stated that one of its sub-committees works on standardization in the field of terminology and symbols;
- CCITT sent in :
  - its notice V.i. : Equivalence between binary notation symbols and the significant conditions of a two-condition Code;
  - its International Telegraphic Alphabet No. 2;
  - the report of its Special Commission A - Contribution No.34;
- UIC reported that work was being done under its care on the document under consideration.

Early in January, Messrs. BLOOM and AUWAERTER, sent by the Committee X3-2 of ASA, came to Europe and submitted to various people their recent proposed American Standard Code. While in Paris, they paid a visit to Mr.FEISSEL in the presence of a representative of AFNOR.

It became apparent that it would be of interest to arrange for a meeting of Group B to take place in France before the one appointed to occur in October on the occasion of the plenary session of Committee 97.

Upon examination, the answers received show :

- that the members of Group B would wish a meeting to take place in May;

- that the most suitable dates would be 2nd, 3rd and 4th May.

The meeting has therefore been organised for these dates in Paris.

B - AGENDA OF THE MAY MEETING IN PARIS

The main item of the proposed agenda is the following :

8 - First elements of an International agreement regarding Character Sets

The mere title of this item of the agenda shows well enough that, in the mind of the Secretariat, discussion will be in the main exploratory. In order to help in this exploration, the following elements of appreciation are submitted :

The two documents UK 1 and USA 1 in the drafting of which the specific demands of computers and of information processing systems have been considered have received the particular attention of the Secretariat.

The British specification presents a basic code with 6 tracks for data (64 combinations) from which are deduced by contraction, extension, and/or adjunction of a parity check track, codes with 4 and 5 data tracks a 7 - track code comprising 6 data tracks and a parity check track, and an 8-track code comprising 7 information tracks and a parity check track.

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The projected USA Standard shows a code with 7 data tracks. In its appendices, it considers the possibility of expansion and contraction, and mentions in particular contraction into a numerical code with 4 data tracks.

There is a certain relationship between these two documents. In the projected USA Standard it is stated in paragraph A.4.2.:
" It was considered essential to have a dense 64 - character subset which contained only graphics..."

If the basic 6-track code (UK 1), page 14 is superimposed upon the dense 64-character subset (USA 1) page 14, it will be seen that the positions allotted to numerical and alphabetical characters are identical.

On the other hand, when one compares the (UK 1) 128-character code (7 data tracks, parity check track) and the USA code, one finds the similarities already mentioned, but very few further similarities appear.

This divergency is due to the fact that the purposes for which an original set of 64 characters or symbols was expanded into one of 128, were not the same.

In the British version the main object was to introduce the lower case alphabet and subscript numbers. In the USA operation, the main purpose was apparently to provide the code with a set of controls adapted to the requirements of teleprinters.

Apart from the official documents which have been mentioned, the Secretariat has been informed of other constructive activities in the field of character and coding lists.

Contacts have been made between representatives of Committee X 3-2 of the ASA and European experts.

Work has been undertaken within the ECMA bearing, among other things, on the elaboration of a 6 track data code. The Secretariat will endeavour to obtain in good time from ECMA details about these efforts.